CLAIMS

I CLAIM AS MY INVENTION:

1. A method comprising:

casting an alloy material to form a component;

performing a solution heat treatment on the component;

subjecting the component to an operating environment;

applying an alloy powder mixture to the component; and

bonding the alloy powder mixture to the component by liquid phase diffusion bonding using a brazing heat treatment that incorporates the solution heat treatment, the alloy powder mixture selected to achieve a desired material property when exposed to the brazing heat treatment.

2. The method of claim 1, further comprising:

selecting the alloy material to be IN 939;

selecting the alloy powder mixture to be a 50/50 ratio by weigh percent of IN 939 and AM 775 alloys;

performing the solution heat treatment as heating the component to 2,120 °F. for four hours followed by cooling to below 1,000 °F. in twenty minutes or less; and

performing the brazing heat treatment cycle as heating the component to 2,120 °F. for four hours, cooling the component to 2,050 °F. and holding for four hours, followed by cooling from 2,050 °F. to below 1,000 °F. in twenty minutes or less.

3. The method of claim 1, further comprising performing a welding process on the component after the step of bonding, wherein the brazing heat treatment functions as a pre-weld heat treatment for the welding process.

4. The method of claim 1, further comprising performing a welding process on the component before the step of bonding, wherein the brazing heat cycle functions as a post-weld heat treatment for the welding process.

5. A method comprising:

casting an alloy material to form a component;

applying an alloy powder mixture to the component; and

performing a solution heat treatment cycle on the component, the solution heat treatment cycle functioning as a brazing heat treatment for bonding the alloy powder mixture to the component by liquid phase diffusion bonding, the powder mixture selected to achieve a desired material property when subjected to the solution heat treatment cycle.

6. The method of claim 5, further comprising:

selecting the alloy material to be IN 939;

selecting the alloy powder mixture to be a 50/50 ratio by weigh percent of IN 939 and AM 775 alloys;

performing the solution heat treatment as heating the component to 2,120 °F. for four hours, cooling the component to 2,050 °F. and holding for four hours, followed by cooling from 2,050 °F. to below 1,000 °F. in twenty minutes or less.

7. The method of claim 5, further comprising:

exposing the component to a high temperature operating environment after the step of performing a solution heat treatment cycle;

applying a second alloy powder mixture to the component;

applying a brazing heat treatment cycle to the component to bond the second alloy powder mixture to the component by liquid phase diffusion bonding, the brazing heat cycle selected to incorporate the solution heat treatment cycle and the second powder mixture selected to achieve a desired material property when subjected to the brazing heat treatment cycle.

8. A method comprising:

applying a first alloy powder mixture to a component formed of an alloy material;

bonding the first alloy powder mixture to the component by liquid phase diffusion bonding using a first brazing heat treatment that accomplishes bonding between the first alloy powder mixture and the component by liquid phase diffusion bonding and that also accomplishes a pre-weld stress relief in the component; and

performing a welding process on the component after the step of bonding.

9. The method of claim 8, further comprising:

selecting the alloy material to be IN 939;

selecting the alloy powder mixture to be a 50/50 ratio by weigh percent of IN 939 and AM 775 alloys; and

performing the first brazing heat treatment as heating the component to 2,120 °F. for four hours, cooling the component to 2,050 °F. and holding for four hours, followed by cooling from 2,050 °F. to below 1,000 °F. in twenty minutes or less.

10. The method of claim 9, wherein the first brazing heat treatment is selected to incorporate a manufacturing solution heat treatment used to form the component.

11. The method of claim 8, further comprising:

applying a second alloy powder mixture to the component; and

bonding the second alloy powder mixture to the component by liquid phase diffusion bonding using a second brazing heat treatment that accomplishes bonding between the second alloy powder mixture and the component by liquid phase diffusion bonding and that also accomplishes a post-weld stress relief in the component.

12. The method of claim 11, wherein the second alloy powder mixture is selected to have essentially the same composition as the first alloy powder mixture and the second brazing heat treatment is selected to be essentially the same as the first brazing heat treatment.

13. A method comprising:

performing a welding process on a component formed of an alloy material;

applying an alloy powder mixture to a portion of the component; and

bonding the alloy powder mixture to the component by liquid phase diffusion bonding using a brazing heat treatment that accomplishes liquid phase diffusion bonding between the alloy powder mixture and the component and that also accomplishes a post weld stress relief in the component.

14. The method of claim 13, further comprising:

selecting the alloy material to be IN 939;

selecting the alloy powder mixture to be a 50/50 ratio by weigh percent of IN 939 and AM 775 alloys; and

performing the brazing heat treatment as heating the component to 2,120 °F. for four hours, cooling the component to 2,050 °F. and holding for four hours, followed by cooling from 2,050 °F. to below 1,000 °F. in twenty minutes or less.

15. The method of claim 13, wherein the brazing heat treatment is selected to incorporate a manufacturing solution heat treatment used to form the component.